

## **REMARKS**

### **THE AMENDMENTS**

Claims 8 and 10 to 13 have been amended to more particularly point out and distinctly claim the subject matter applicants regard as the invention. The word “ponderal” has been replaced by “weight”. The claim now clearly recites that there is a particular weight ratio of the cycloalkane component to the aliphatic hydrocarbon aliphatic in the mixture.

This amendment is supported by the original claims, particularly claim 14 itself, which uses the phrase “weight ratio”, as well as the specification where, for example, E is defined as the ponderal fraction or weight % of the components.

New claims 16 to 20 have been added. Independent claims 16 and 19 correspond to originally filed claims 1(a) and 1(c) respectively, and claims 17, 18 and 20 correspond to claims 2, 8 and 10 respectively, except that they are now dependent on claims 16 and 19.

Applicants respectfully submit that this amendment adds no new matter to the application and request that the Examiner enter the Amendment.

### **THE OFFICE ACTION**

Claims 1 to 15 are pending and were examined. New claims 16 to 20 have been presented with this Amendment.

Claims 8 and 10 to 13 stand rejected under 35 U.S.C. § 112, second paragraph, as indefinite for failure to particularly point out and distinctly claim the subject matter applicants regard as the invention. The Examiner stated that it is unclear what the “ponderal ratio” limitation is describing. Claims 8 and 10 to 13 have been amended to claim a “weight ratio”

instead of a “ponderal ratio”, as described above. Applicants thus traverse this rejection and respectfully request that the rejection of claims 8 and 10 to 13 be reconsidered and withdrawn.

Claims 1 to 15 stand rejected under 35 U.S.C. § 103(a) as obvious over Scoggin, US Patent 3,227,526.

The Examiner stated that regarding claims 1, 2, 4 to 7, 14 and 15, Scoggin discloses a fluid composition of a diluent consisting essentially of paraffinic hydrocarbons such as n-hexane and 2,2,4-trimethylpentane, and cycloalkane-alkyl naphthenic hydrocarbons such as methylcyclohexane and ethylcyclohexane in combination, and Scoggin further discloses that the diluent is used in the context of olefin production, but is separated and isolated during the production process and identifies the diluent composition as a heat transfer medium and used in such way that the diluent temperature is usable in maintaining a desired temperature within the polymerization zone, which meets the claimed limitation of a heat transfer fluid consisting essentially of component (c). The Examiner further stated that Scoggin teaches the advantage of the diluent fluid’s thermal transfer properties, but Scoggin does not teach specific ratios at which the aliphatic hydrocarbon and cycloalkane components are present in combination, and further Scoggin does not disclose the components at such a level that the composition (diluent) has a cloud point below -100°C, a vapor pressure at +175°C of below 1300 kPa, and a viscosity below 400 cP at the cloud point temperature of +10°C.

The Examiner stated that cloud points, vapor pressures and viscosities are inherent properties of chemical compounds such as n-hexane, 2,2,4-trimethylpentane, methylcyclohexane and ethylcyclohexane, one of ordinary skill in the art at the time of the invention would have found obvious the adjustability of concentrations of both aliphatic hydrocarbon content and cycloalkane content in combination to arrive at the claimed ranges according to desired results as

it pertains to thermal transfer properties and within a reasonable expectation of success, and such adjustments in concentrations do not impart patentability unless it is shown that the claimed range results in unexpected results different in kind and not merely in degree to that of the prior art.

The Examiner further stated that regarding claims 10, 12 and 13, Scoggin is silent on the claimed ponderal ratio of cycloalkane component to aliphatic hydrocarbon of from 97:3 to 10:90, 80:20 to 25:75 or 70:30 to 35:65, but one of ordinary skill in the art would have found obvious, as relied upon above, the adjustment of the concentrations between the two components to arrive at the claimed ponderal ratios as claimed according to desired results as it pertains to the thermal conductive properties utilized and disclosed in Scoggin, and one of ordinary skill in the art would have found obvious the adjustability of such ranges according to desired results with a reasonable expectation of success, and such adjustments in concentrations do not impart patentability unless it is shown that the claimed range results in unexpected results different in kind and not merely in degree to that of the prior art. The Examiner concluded that claims 3, 8, 9 and 11 pertain to dependent limitations on group (a) or (b) of the Markush group claimed in rejected claim 1.

The Examiner admits that Applicants' claims are different from Scoggin and that Scoggin does not disclose the components at such a level that the composition (diluent) has a cloud point below -100°C, a vapor pressure at +175°C of below 1300 kPa, and a viscosity below 400 cP at the cloud point temperature of +10°C.

The Examiner construes the disclosure in Scoggin of a liquid diluent comprising a hydrocarbon that is a solvent for the ethylene feed, where the hydrocarbon may advantageously be paraffinic or naphthenic (column 1, line 40 to column 2, line 4) as a teaching of a heat transfer

fluid having Applicants' claimed properties.

The Examiner admits that Scoggin does not teach specific ratios at which the aliphatic hydrocarbon and cycloalkane components are present in combination, and further Scoggin does not disclose the components at such a level that the composition (diluent) has a cloud point below  $-100^{\circ}\text{C}$ , a vapor pressure at  $+175^{\circ}\text{C}$  of below 1300 kPa, and a viscosity below 400 cP at the cloud point temperature of  $+10^{\circ}\text{C}$ .

The Examiner asserts that "one of ordinary skill in the art at the time of invention would have found obvious the adjustability of concentrations...to arrive at the claimed ranges according to desired results". *See* Office Action, page 4.

### **THE CITED DOCUMENT IN RELATION TO THE CLAIMS**

#### **Scoggin**

Scoggin discloses a reaction system for a polymerization process where a hydrocarbon is used as a **solvent** or **diluent** that serves as an inert dispersant. Scoggin is not disclosing a heat transfer fluid that consists essentially of certain components at a certain level such that the composition has: a cloud point below  $-100^{\circ}\text{C}$ .; a vapor pressure, at  $+175^{\circ}\text{C}$ ., below 1300 kPa; and a viscosity, measured at the cloud point temperature  $+10^{\circ}\text{C}$ ., below 400 cP. Specific examples are limited, and no specific combinations meeting Applicants' combinations are disclosed. The temperature range in which the polymerization takes place, at its broadest range, is between 150 and  $250^{\circ}\text{F}$ . This temperature range gives no idea what the freezing point actually is for the diluent. Scoggin later refers to the diluent being separated from a slurry comprising polymer particles and diluent and passing a portion of the diluent through a cooling zone. *See* Scoggin, column 3, lines 58 to 70. Applicants respectfully submit that 'passing a portion of the

diluent through a cooling zone' is **not** using the fluid as a heat transfer fluid, but instead, is merely stating that the diluent or hydrocarbon is cooled after the polymerization.

**Clause 'a' of claim 1**

Scoggin does not disclose a heat transfer fluid comprising a mixture of at least two structurally non-identical saturated cycloalkane-alkyl or -polyalkyl components, wherein the cycloalkane moiety contains from 5 to 8 carbon atoms, the alkyl moiety contains from 1 to 6 carbon atoms with the proviso that the total number of carbon atoms in the alkyl moiety(ies) on the cycloalkane-alkyl and cycloalkane-polyalkyl compounds together is in the range of from 1 to 10. Rather, Scoggin merely discloses paraffinic or naphthenic hydrocarbon compounds generally that can be used as inert dispersants or liquid hydrocarbon diluents. These compounds are not used in any example, and certainly there is no example of this combination, or more particularly, this combination having Applicants' claimed properties.

Scoggin also teaches unambiguously that the hydrocarbon is the liquid diluent used in a process where ethylene or mixtures of ethylene and other unsaturated hydrocarbons are contacted with a suspension of a chromium oxide-containing catalyst in a liquid hydrocarbon diluent.

**Clause 'b' of claim 1**

Scoggin does not appear to identify a mixture of, at least, two structurally non-identical saturated aliphatic hydrocarbons having a linear or branched chain with from 5 to 15 carbon atoms.

**Clause 'c' of claim 1**

Scoggin does not appear to identify a mixture of, at least, a saturated cycloalkane-alkyl or -polyalkyl, wherein the cycloalkane moiety contains from 5 to 8 carbon atoms, the alkyl moiety contains from 1 to 6 carbon atoms with the proviso that the total number of carbon atoms in the alkyl moiety(ies) on the cycloalkane-alkyl and cycloalkane-polyalkyl compounds together is in the range of from 1 to 10, and a saturated aliphatic hydrocarbon having a linear or branched chain with from 5 to 15 carbon atoms, and more particularly, a mixture having Applicants' claimed properties.

#### **Remaining elements of claim 1**

Scoggin is silent with regard to cloud point, vapor pressure at 175°C, and viscosity measured at a temperature 10°C higher than the cloud point. Scoggin merely discloses that the diluent is a liquid, and that it is critical that the hydrocarbon be maintained in the liquid phase. *See*, for example, Scoggin, column 2, lines 5 to 16.

#### **Claims 2 to 15**

Scoggin's disclosure of different paraffinic or naphthenic hydrocarbons for use as a liquid diluent in a polymerization reaction does not disclose a combination of two structurally different compounds for use as a heat transfer fluid having Applicants' specific claimed properties. Scoggin does not disclose or suggest the proposed combination. Scoggin's disclosure teaches no mixture of two saturated compounds in the claimed weight ratios.

### **THE INVENTION**

The invention is directed to a heat transfer fluid for use over a broad range of temperatures. The fluid consists essentially of a component selected from the group consisting of (a) a mixture of at least two structurally non-identical saturated cycloalkane-alkyl or -polyalkyl components, (b) a mixture of, at least, two structurally non-identical saturated

aliphatic hydrocarbons having a linear or branched chain with from 5 to 15 carbon atoms; and (c) a mixture of, at least, a saturated cycloalkane-alkyl or -polyalkyl and a saturated aliphatic hydrocarbon having particular carbon numbers. The cycloalkane moiety of the first mixture contains from 5 to 8 carbon atoms, the alkyl moiety contains from 1 to 6 carbon atoms with the proviso that the total number of carbon atoms in the alkyl moiety(ies) on the cycloalkane-alkyl and cycloalkane-polyalkyl compounds together is in the range of from 1 to 10. The cycloalkane moiety of the third contains from 5 to 8 carbon atoms, the alkyl moiety contains from 1 to 6 carbon atoms with the proviso that the total number of carbon atoms in the alkyl moiety(ies) on the cycloalkane-alkyl and cycloalkane-polyalkyl compounds together is in the range of from 1 to 10, and the saturated aliphatic hydrocarbon has a linear or branched chain with from 5 to 15 carbon atoms. The composition has: a cloud point below -100 °C., a vapor pressure, at +175 °C., below 1300 kPa; and a viscosity, measured at the cloud point temperature +10 °C., below 400 cP.

The dependent claims are directed to specific features of the invention.

## **THE INVENTION IN VIEW OF THE CITED DOCUMENT**

### ***Formalities***

Applicants have amended claims 8 and 10 to 13 to more particularly point out and distinctly claim the subject matter Applicants regard as the invention.

Therefore, Applicants respectfully traverse the formal rejection of claims 8, 10 and 13 under 35 U.S.C. § 112, second paragraph.

### ***On the Merits***

Applicants respectfully traverse the pending rejections. Scoggin does not disclose the invention as claimed. Scoggin does not make obvious claims 1 to 15. Claims 2 to 15 are

dependent, directly or indirectly, from claim 1, and so are allowable for at least the reasons claim 1 is allowable.

**Over-arching discussion for all claims**

All claims are directed to heat transfer fluids that (1) consist essentially of (2) saturated hydrocarbons and (3) have properties and characteristics that are not inherently disclosed in other heat transfer fluid compositions. Applicants respectfully submit therefore that the pending claims are essentially limited to saturated compounds, and combinations of these saturated compounds having specific properties.

Applicants respectfully submit that the properties and characteristics of these compounds are not inherently disclosed in Scoggin or anywhere else. Information in the specification clearly illustrates that the properties and characteristics of these compounds are related to composition, both by difference in proportion and difference in structure, even by only 1 carbon atom (for example, ethylcyclohexane and methylhexane), and that small differences in either can result in a profound difference in the properties and characteristics of the resultant heat transfer fluids.

The following comparisons, taken from the table in paragraph 22 of the pending patent application publication, are instructive. These are only examples to highlight the changes in properties with changes in composition or proportion. In the table, property C is vapor pressure at 175°C, in kPa, and D is viscosity in cP at the cloud point temperature + 10°C:



<b>Sample Numbers Compared</b>	<b>Change and Effect Thereof</b>
8 and 17	Change of proportion and from methyl-cyclopentane to ethyl-cyclohexane changes C and D
20 and 21	Small difference in proportion changes C and D in opposite directions
25 and 26	Change from ethyl-cyclohexane to 2-methyl-hexane changes C and D in opposite directions
43 and 46	Change from 2-methyl-hexane to ethyl-cyclohexane changes C and D in opposite directions
17 and 19	Change from ethyl-cyclohexane to 2-methyl-hexane changes C and D in opposite directions
29 and 30	Small difference in proportion changes C and D in opposite directions
35 and 37	Change from 2-methyl-hexane to ethyl-cyclohexane changes C and D in opposite directions
72 and 73	Change from 2-methylpentane to 3-methylpentane changes C and D

### **Specifics for the claims**

Applicants respectfully traverse the rejection of claim 1 as obvious over Scoggin. The Office Action identifies liquid hydrocarbons such as paraffins (for example n-hexane and 2,2,4-trimethylpentane), and cycloalkane-alkyl naphthenic hydrocarbons such as methylcyclohexane and ethylcyclohexane, from a list of components in Scoggin that can be used as a solvent, as teaching the components of subparagraph (c). Subparagraph (c) is one of the three parts of the Markush Group.

The Office Action then concludes with the statement that “claims 3, 8, 9, and 11 pertain

to dependent limitations on group (a) or (b) of the Markush group” and therefore “these claims stand rejected”. *See* Office Action, page 5. Applicants respectfully submit that claim 1, subparagraphs (a), (b) and/or (c) are not obvious over Scoggin, as asserted in the Office Action.

Applicants respectfully submit that Scoggin does not disclose that two or more compounds are used together as a heat transfer fluid, and, more importantly, Scoggin does not disclose that the heat transfer fluid consists essentially of a mixture of, at least, a saturated cycloalkane-alkyl or -polyalkyl, wherein the cycloalkane moiety contains from 5 to 8 carbon atoms, the alkyl moiety contains from 1 to 6 carbon atoms with the proviso that the total number of carbon atoms in the alkyl moiety(ies) on the cycloalkane-alkyl and cycloalkane-polyalkyl compounds together is in the range of from 1 to 10, and a saturated aliphatic hydrocarbon having a linear or branched chain with from 5 to 15 carbon atoms; at a level such that the composition has: a cloud point below -100 °C.; a vapor pressure, at +175 °C., below 1300 kPa; and a viscosity, measured at the cloud point temperature +10 °C., below 400 cP. Rather, this proposed combination was selected with hindsight **only** in view of the teachings of Applicants’ disclosure from the broad teachings of Scoggin which discloses that hydrocarbons may be used as a diluent or solvent for an ethylene feed in a polymerization reaction. *See* Scoggin, column 1, lines 37 to 65. Scoggin merely states that the liquid hydrocarbon “serves as an inert dispersant and heat transfer medium in the practice of the process” of polymerization. *See* Scoggin, column 1, lines 45 to 47. The liquid hydrocarbon is only part of the stream; it is used in conjunction with ethylene or mixtures of ethylene with other unsaturated hydrocarbons that are contacted with a suspension of a chromium oxide-containing catalyst in the liquid hydrocarbon diluent. *See* Scoggin, column 1, lines 37 to 40. The polymerization reaction occurs at low temperatures of from about 150 to 250°F (approximately 65 to 125°C). *See* Scoggin, column 2, lines 5 to 35.

Applicants respectfully submit that the assertion that the properties and characteristics recited in claim 1 are inherent to the composition is not well-founded. Whereas it is true that the properties and characteristics of a composition are related to the ingredients in the composition, this assertion is not relevant to patentability. In particular, this assertion does not address the point that each composition will have a different set of properties and characteristics, and there is no reason to expect that any, or all, properties and characteristics will fall within the limitation.

Applicants respectfully submit that the important point here is that the properties and characteristics of the compounds claimed herein are not inherently disclosed in Scoggin. Indeed, Scoggin does not discuss cloud point, vapor pressure, or viscosity at a temperature 10°C above the cloud temperature. The rejection relies on the selection of two compounds only because they meet the claims herein, without a suggestion to select those two compounds from the list of illustrative compounds set forth in a list that can be used as a solvent or diluent. Thus, one cannot assert that Scoggin's compositions make obvious those of claim 1 without knowing these values. This assertion from the Examiner does not establish a *prima facie* case for obviousness. Thus, Applicants respectfully submit that the combinations having the claimed properties and characteristics are not disclosed in Scoggin, inherently or otherwise, and cannot be said to be inherently disclosed. Applicants respectfully submit that, the remaining claims being dependent from claim 1, all claims are allowable over Scoggin.

Applicants also respectfully submit that for at least the reasons previously discussed, Scoggin also does not disclose new claims 16 to 20.

## **CONCLUSION**

Applicants respectfully traverse the rejections. The cited document neither suggests nor discloses the claimed invention. Indeed, the proposed combination claimed by Applicants can only be made with impermissible hindsight reconstruction based on review of the pending application. Further, the proposed combination would not be made by the skilled practitioner when reading Scoggin.

Applicants respectfully submit that these claims are in condition for allowance and respectfully and earnestly solicit favorable action thereon.

Respectfully submitted,

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